



**Monthly Performance Report  
October 2011**

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## ESSP SAS

EGNOS Monthly Performance Report - October 2011

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# 1 EGNOS SIS AVAILABILITY

*In this document, **EGNOS SIS Availability** is defined as the percentage of time in the month during which at least one geostationary satellite broadcasts EGNOS messages.*

In addition to the SIS availability for PRN120 and PRN124, the following values are also reported:

- percentage of time in the month during which at least one geostationary satellite broadcasts EGNOS messages (PRN120 or PRN124);
- percentage of time in the month during which both geostationary satellites broadcast EGNOS messages (PRN120 and PRN124).

EGNOS SIS monitoring during October 2011, reports the following reception percentage of an SBAS message:

- PRN120 Availability: **99.80%**
- PRN124 Availability: **99.85%**
- SIS - PRN120 or PRN 124: **100.00%**
- PRN120 and PRN124: **99.65%**

The following figure presents the availability of the signal in both EGNOS GEO satellites (PRN120 and PRN124). Red dots correspond to unavailability periods:

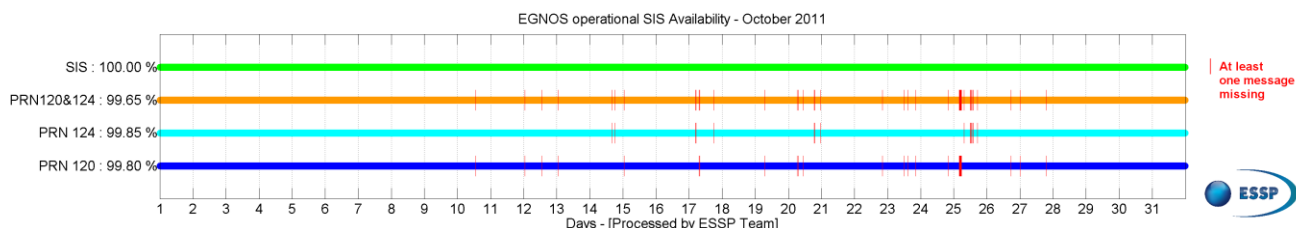


Figure 1 – EGNOS SIS & PRN Availability for October 2011(%).

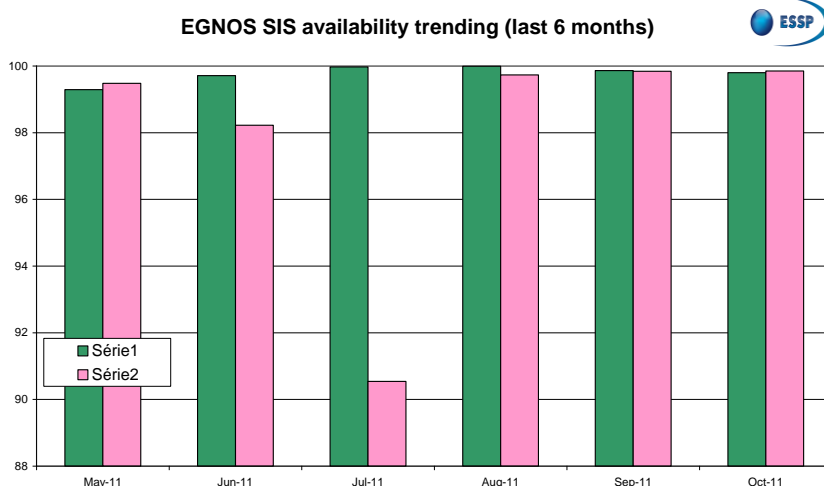


Figure 2 – Trending of EGNOS SIS Availability per GEO.

Availability (%)	05/11	06/11	07/11	08/11	09/11	10/11
PRN120	99.29	99.71	99.97	99.99	99.86	99.80
PRN124	99.48	98.22	90.54	99.73	99.84	99.85
SIS: At least one EGNOS GEO satellite	100	100	100	100	100	100

Table 1 – EGNOS SIS Availability (%) on EGNOS GEO satellites.

## 2 OPEN SERVICE (OS)

### 2.1 Receiver Monitoring network

The receiver network used to report EGNOS performances in this document is mainly composed of EGNOS monitoring stations (RIMS), except in the case of the receiver located at Torrejón.

Next map shows the location of sites reported:

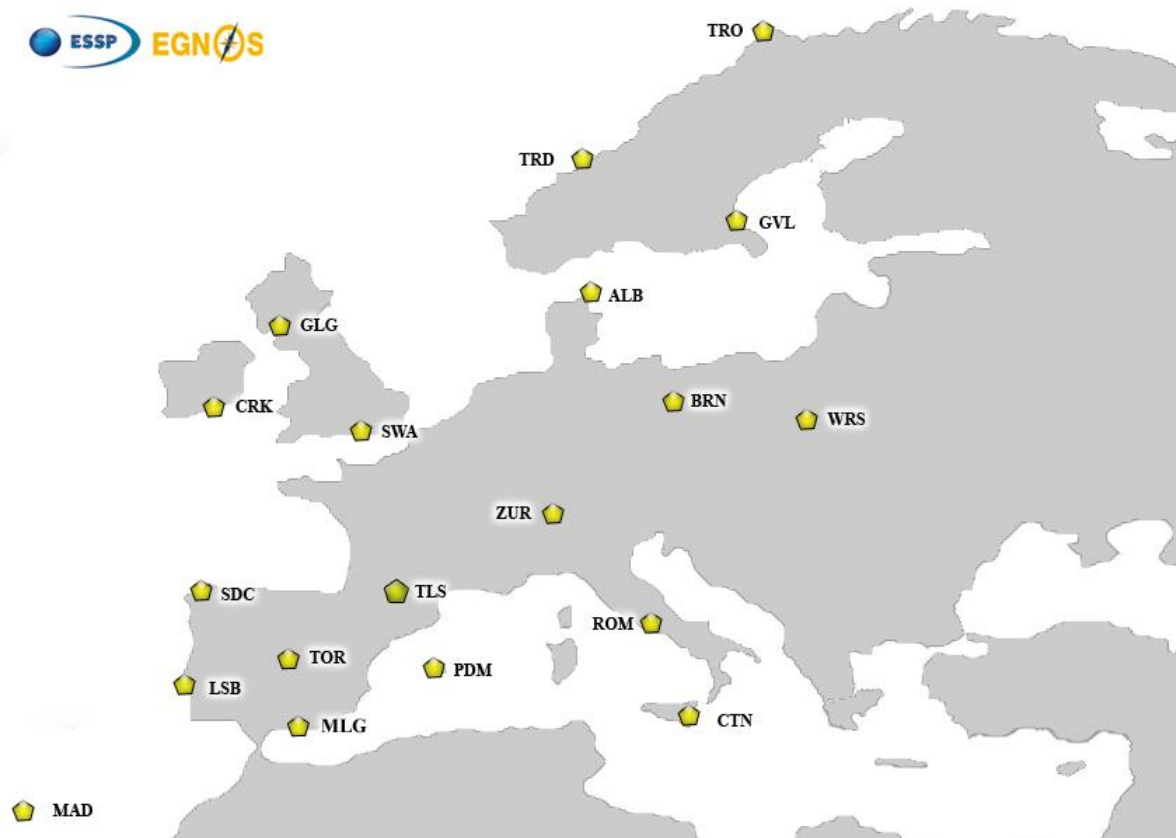


Figure 3 – Receiver monitoring network.

ID	Location name	Country	ID	Location name	Country
ALB	Alborg	Denmark	PDM	Palma de Mallorca	Spain
BRN	Berlin	Germany	ROM	Rome	Italy
CTN	Catania	Italy	SDC	S. de Compostela	Spain
CRK	Cork	Ireland	GVL	Gävle	Sweden
WRS	Warsaw	Poland	TLS	Toulouse	France
GLG	Glasgow	United Kingdom	TRD	Trondheim	Norway
LSB	Lisbon	Portugal	TRO	Tromsøe	Norway
SWA	Swanwick	United Kingdom	ZUR	Zürich	Switzerland
MAD	Madeira	Portugal	TOR	Torrejón- SBAS receiver	Spain
MLG	Málaga	Spain			

Table 2 - List of sites where performances are reported.



## 2.2 EGNOS Horizontal and Vertical Accuracy

Accuracy is a measure of the position error, which is the difference between the estimated navigation position and the actual position.

*EGNOS OS Horizontal Accuracy is reported in this document as the 95<sup>th</sup> percentile of the Horizontal Navigation System Error (HNSE) over a day, at the monitored sites when applying EGNOS messages. The HNSE is measured only when there is a valid PA navigation solution.*

*EGNOS OS Vertical Accuracy is reported in this document as the 95<sup>th</sup> percentile the Vertical Navigation System Error (VNSE) over a day, at the monitored sites when applying EGNOS messages. The VNSE is measured only when there is a valid PA navigation solution.*

Table 3 provides the maximum of the values of accuracy at 95% measured on a daily basis during the last six months. The unit of these figures is meters.

PRN 120		05/11	06/11	07/11	08/11	09/11	10/11	Average
MLG	HPE	1.17	1.21	1.22	1.27	2.13	1.96	1.49
	VPE	1.64	1.57	1.71	1.61	2.22	2.61	1.89
SDC	HPE	1.20	1.27	1.16	1.26	1.62	1.44	1.33
	VPE	1.56	1.38	1.47	1.61	2.03	2.25	1.72
PDM	HPE	1.02	1.05	1.04	1.20	1.83	1.30	1.24
	VPE	1.32	1.40	1.37	1.65	1.67	1.77	1.53
LSB	HPE	1.21	1.26	1.37	1.32	2.68	1.76	1.60
	VPE	2.13	2.45	2.29	2.35	2.57	3.18	2.50
TRD	HPE	0.89	0.86	0.76	0.93	1.41	2.13	1.16
	VPE	1.89	1.66	1.69	2.25	3.08	3.58	2.36
CRK	HPE	1.07	0.89	1.24	1.14	1.59	1.51	1.24
	VPE	1.38	1.30	1.61	1.62	2.05	1.98	1.66
ZUR	HPE	1.01	0.97	1.01	1.07	1.15	1.32	1.09
	VPE	1.33	1.31	1.18	1.03	1.42	1.44	1.29
BRN	HPE	0.97	0.82	0.84	0.99	1.32	1.33	1.05
	VPE	1.36	1.41	1.34	1.45	1.83	1.68	1.51
TLS	HPE	1.09	1.06	1.01	1.11	1.22	1.06	1.09
	VPE	1.58	1.25	1.22	1.09	1.48	1.57	1.37
TRO	HPE	1.41	1.37	1.28	1.24	2.17	4.28	1.96
	VPE	3.14	3.02	2.62	2.49	3.91	5.00	3.36
SWA	HPE	1.46	1.23	1.31	1.44	1.50	1.42	1.39
	VPE	1.80	1.77	1.59	1.67	2.12	1.83	1.80
ROM	HPE	1.02	0.87	1.07	1.13	1.13	1.18	1.07
	VPE	1.35	1.21	1.53	1.52	1.49	1.70	1.47
ALB	HPE	0.76	0.72	0.65	0.74	1.27	1.45	0.93
	VPE	1.59	1.42	1.71	1.45	1.95	2.51	1.77
GLG	HPE	0.82	0.88	1.64	0.87	1.53	1.49	1.21
	VPE	1.40	1.29	1.58	1.51	2.48	2.38	1.77
GVL	HPE	0.73	0.77	0.69	0.81	1.43	1.67	1.02
	VPE	1.94	1.63	1.76	1.76	2.63	2.65	2.06
WRS	HPE	1.07	1.09	0.95	1.22	1.39	1.57	1.22
	VPE	1.86	1.64	1.37	1.63	2.03	2.10	1.77
CTN	HPE	1.15	1.17	1.24	1.49	1.54	1.60	1.37
	VPE	1.93	2.09	2.23	2.18	2.33	2.54	2.22
MAD	HPE	1.50	1.63	1.87	1.80	2.31	3.13	2.04
	VPE	2.32	3.11	2.54	2.50	3.10	3.66	2.87
TOR	HPE	1.15	1.10	1.00	1.09	1.34	1.41	1.18
	VPE	1.35	1.28	1.30	1.35	1.75	1.79	1.47

PRN 124		05/11	06/11	07/11	08/11	09/11	10/11	Average
MLG	HPE	1.16	1.21	1.53	1.29	2.14	1.90	1.54
	VPE	1.65	1.60	1.68	1.61	2.23	2.60	1.90
SDC	HPE	1.20	1.25	1.39	1.24	1.53	1.43	1.34
	VPE	1.52	1.37	1.45	1.52	1.91	2.20	1.66
PDM	HPE	1.02	1.05	1.43	1.24	1.85	1.31	1.32
	VPE	1.32	1.39	1.41	1.65	1.70	1.77	1.54
LSB	HPE	1.21	1.31	1.69	1.31	2.81	1.80	1.69
	VPE	2.18	2.20	2.28	2.38	2.58	3.11	2.46
TRD	HPE	0.88	0.86	0.71	0.88	1.42	2.16	1.15
	VPE	1.89	1.69	1.68	2.24	2.97	3.42	2.32
CRK	HPE	1.06	0.93	1.26	1.14	1.53	1.45	1.23
	VPE	1.38	1.29	1.60	1.63	1.99	1.98	1.65
ZUR	HPE	1.01	0.98	1.21	1.07	1.17	1.32	1.13
	VPE	1.34	1.30	1.17	1.05	1.38	1.45	1.28
BRN	HPE	0.98	0.83	0.93	1.01	1.26	1.35	1.06
	VPE	1.34	1.42	1.33	1.44	1.72	1.69	1.49
TLS	HPE	1.09	1.04	1.14	1.09	1.23	1.07	1.11
	VPE	1.58	1.24	1.21	1.11	1.42	1.62	1.36
TRO	HPE	1.43	1.37	1.35	1.26	1.72	4.33	1.91
	VPE	3.11	2.98	2.72	2.55	3.56	5.06	3.33
SWA	HPE	1.44	1.46	1.40	1.44	1.46	1.42	1.44
	VPE	1.80	1.78	1.56	1.68	2.04	1.85	1.79
ROM	HPE	1.02	0.86	1.41	1.17	1.11	1.16	1.12
	VPE	1.35	1.27	1.54	1.53	1.48	1.70	1.48
ALB	HPE	0.73	0.71	0.65	0.74	1.27	1.44	0.92
	VPE	1.57	1.41	1.69	1.49	1.94	2.59	1.78
GLG	HPE	0.83	0.88	1.65	0.86	1.51	1.45	1.20
	VPE	1.39	1.29	1.54	1.50	2.46	2.47	1.78
GVL	HPE	0.75	0.77	0.70	0.81	1.40	1.69	1.02
	VPE	1.90	1.62	1.73	1.77	2.44	2.72	2.03
WRS	HPE	1.08	1.07	1.22	1.22	1.41	1.61	1.27
	VPE	1.77	1.65	1.40	1.64	2.04	2.12	1.77
CTN	HPE	1.14	1.19	1.40	1.47	1.52	1.62	1.39
	VPE	1.94	2.07	2.28	2.24	2.23	2.63	2.23
MAD	HPE	1.49	1.64	1.93	1.81	2.28	3.06	2.04
	VPE	2.46	3.13	2.12	2.45	3.04	3.67	2.81
TOR	HPE	1.14	1.09	1.20	1.08	1.35	1.39	1.21
	VPE	1.30	1.27	1.31	1.33	1.72	1.83	1.46

Table 3 - Trending of the maximum daily accuracy values per month.

Next histograms show the distribution of HNSE (Horizontal Navigation System Error) and VNSE (Vertical Navigation System Error), which are computed at RIMS A sites for each second over the current month, across the range of values.

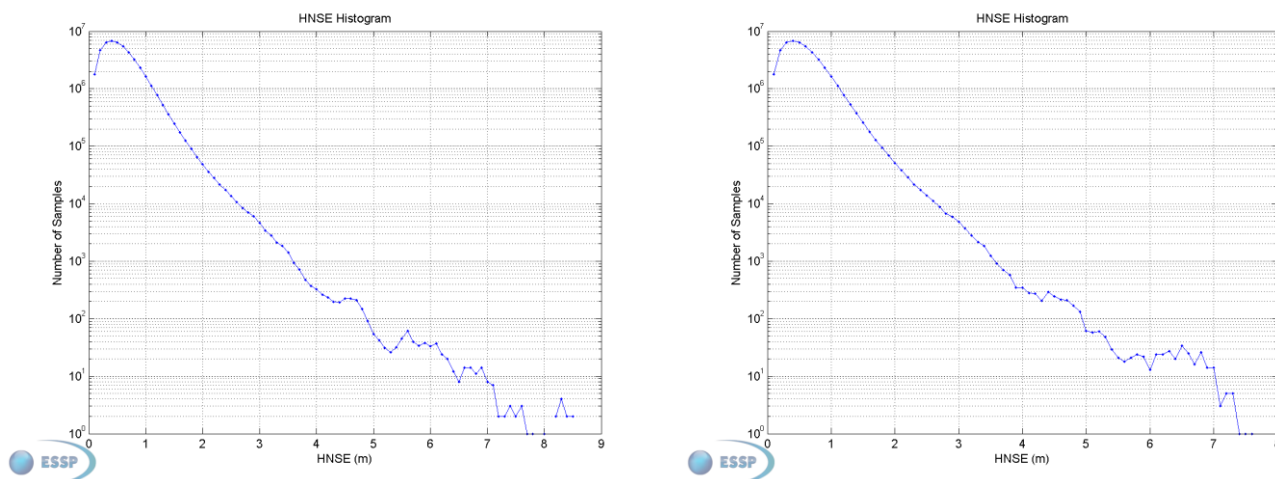


Figure 4 – EGNOS APV-I Horizontal Navigation System Error: PRN 120 (left) and PRN124 (right).

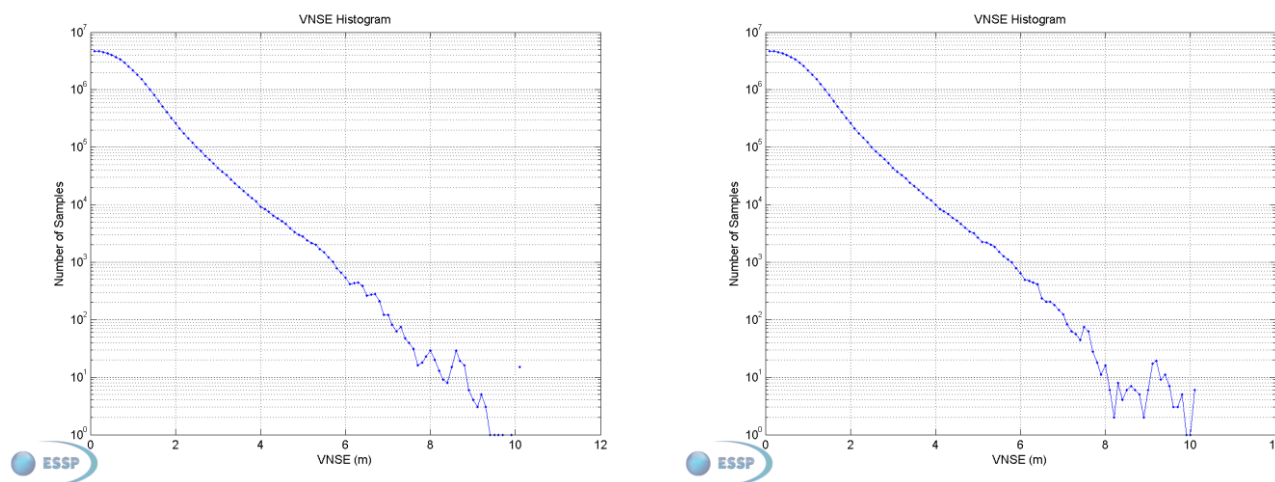


Figure 5 – EGNOS APV-I Vertical Navigation System Error: PRN 120 (left) and PRN124 (right).

### 2.3 EGNOS Open Service Availability

*EGNOS OS Availability performance is defined in the present document as the percentage of time when the instantaneous HNSE is lower than 3 meters and the instantaneous VNSE is lower than 4 meter over the total number of samples with valid PA navigation solution*

The following figures present, for each EGNOS GEO satellite, the Open Service availability measured in the monitoring stations for the reported month. The highlighted region represents the commitment as published in the Open Service Definition Document ([RD 1]).

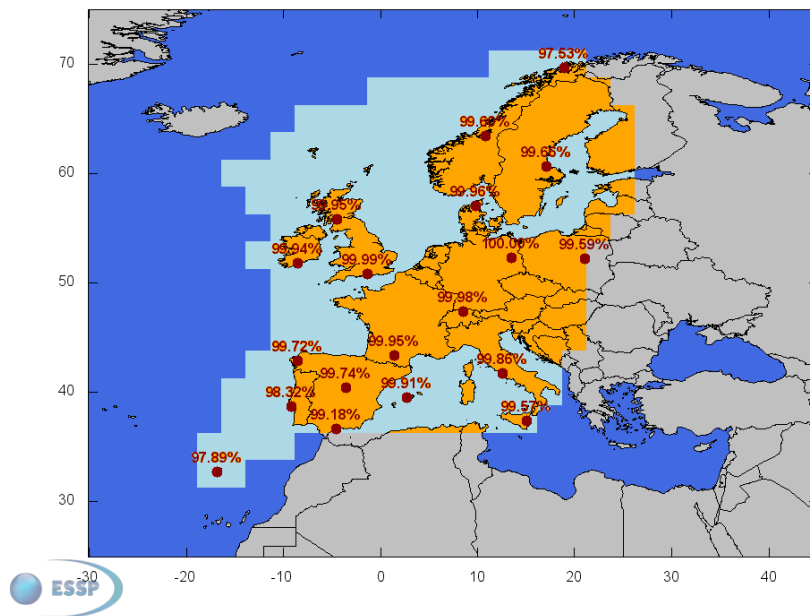


Figure 6 – EGNOS Open Service Availability at reference stations (PRN120).

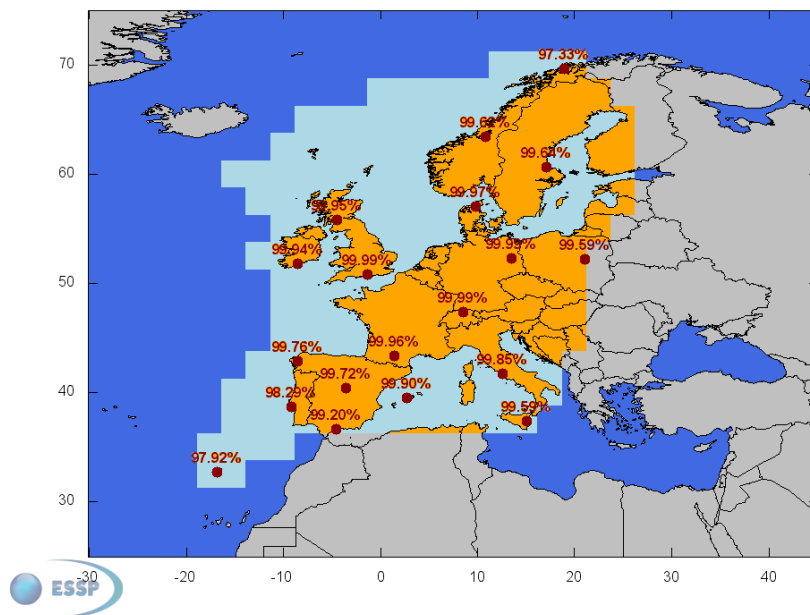


Figure 7 - EGNOS Open Service Availability at reference stations (PRN124).

### 3 SAFETY-OF-LIFE SERVICE (SOL)

#### 3.1 EGNOS Non Precision Approach (NPA)

##### 3.1.1 EGNOS NPA availability

*In this report, EGNOS NPA Availability is defined as the percentage of samples in which the Horizontal Protection Level is below Alert Limit for NPA (HPL<556m) over the total period.*

The following figure presents EGNOS NPA Availability over the current month using GEO-combined maps for the PRN120 and PRN124. NPA Availability considering RAIM is not taken into account in this report.

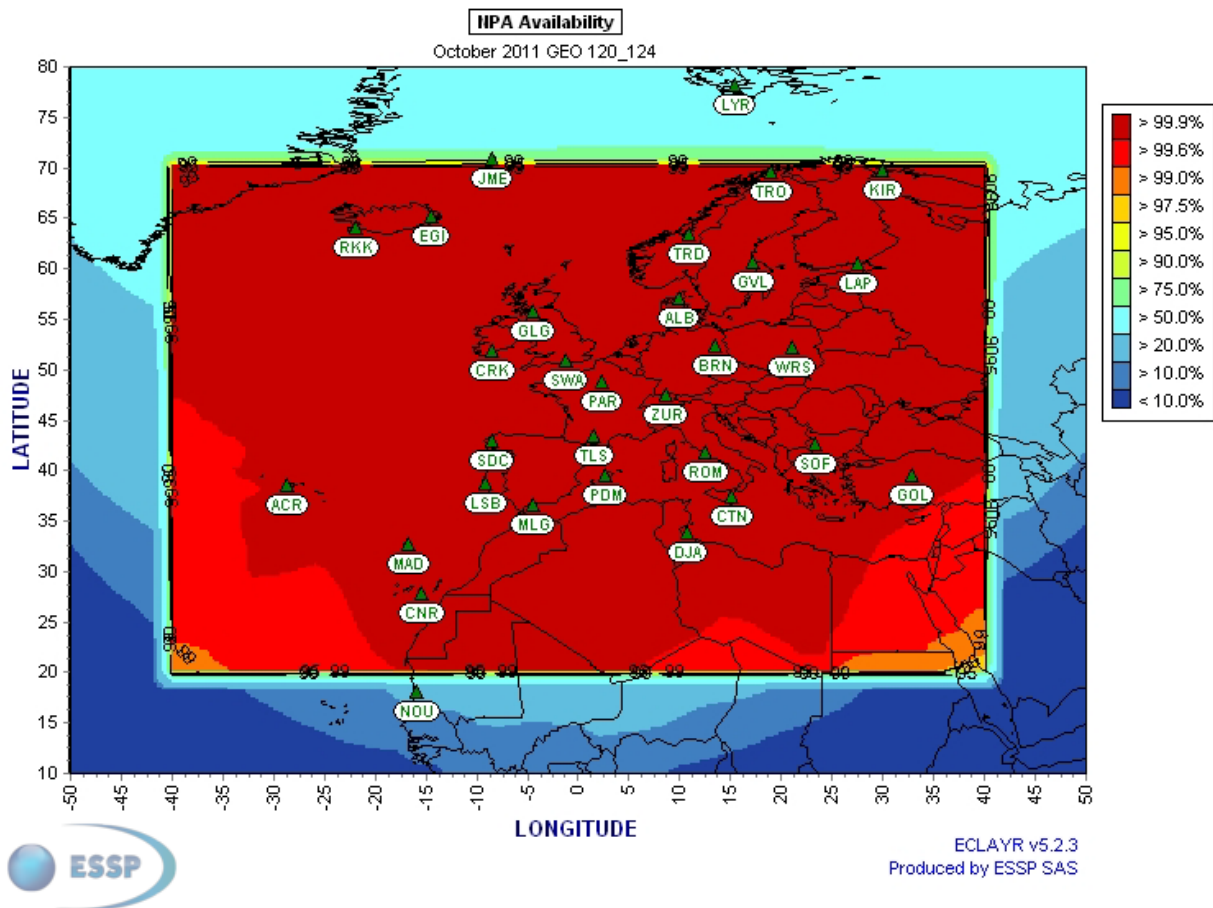


Figure 8 - EGNOS NPA Availability.

### 3.1.2 EGNOS NPA Continuity

*In this document, **EGNOS NPA Continuity** is reported as the result of dividing the total number of single continuity breaks using a time-sliding window of 1 hour by the number samples with valid and available NPA navigation solution. A single continuity break occurs if the system is available and, at least one second inside the following time-sliding window of 1 hour becomes not available.*

The following picture presents EGNOS NPA Continuity using GEO-combined maps for the PRN120 and PRN124. The non nominal performances are due to several factors under close assessment and particular attention.

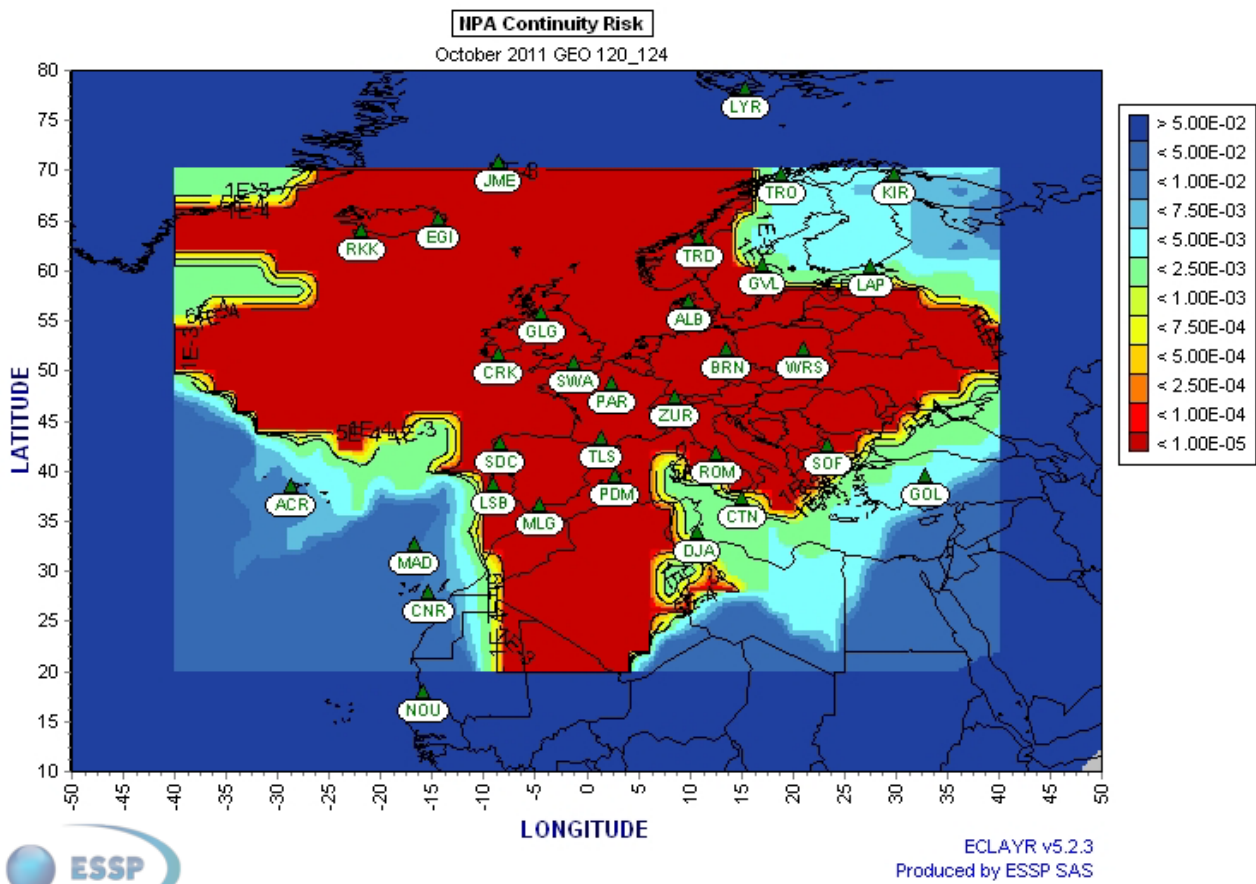


Figure 9 - EGNOS NPA Continuity.

### 3.1.3 EGNOS NPA Integrity Events

**EGNOS NPA Integrity Event** is identified in the present report when the Navigation System Error is greater or equal to the corresponding Protection Level for NPA.

No integrity event was detected.

**Safety index** is defined as the relation between Navigation System Error versus Protection Level (assuming NPA algorithms to compute  $xNSE$  and  $xPL$ ) for each second. Case of ratio  $xNSE/xPL$  is over 1, it indicates that a Misleading Information situation has occurred.

Next histograms show the distribution of HSI (Horizontal Safety Index), which is computed at RIMS A sites for each second over the current month, across the range of values. These histograms take into account the epochs in which the NPA service is available (Protection Level < NPA Alarm Limit).

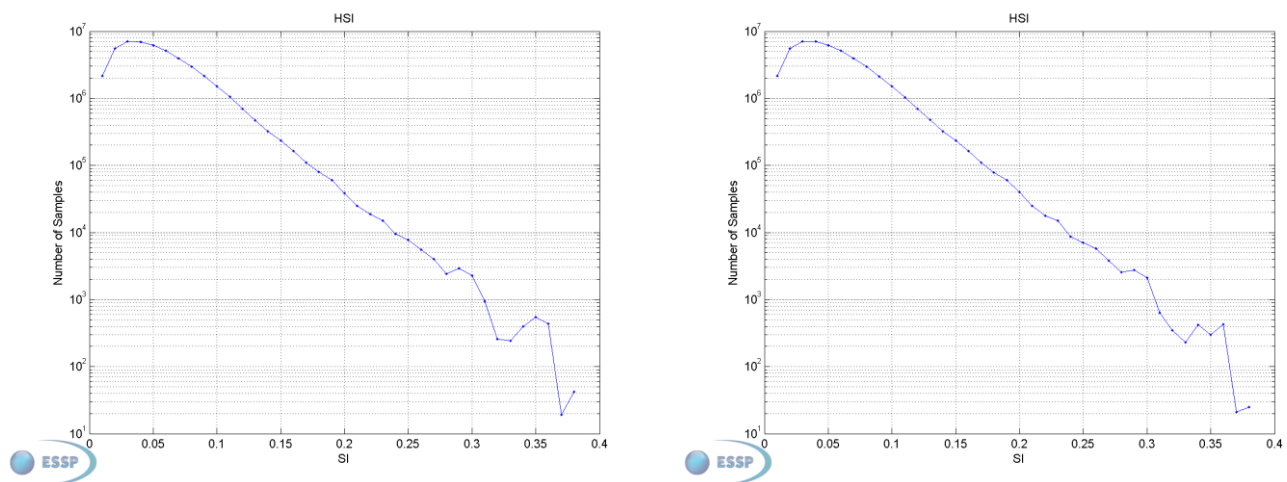


Figure 10 – EGNOS NPA Horizontal Safety Index of the month: PRN 120 (left) and PRN124 (right).



### 3.1.4 EGNOS NPA Accuracy

*In this document, EGNOS NPA Accuracy is reported as the monthly average value of 95<sup>th</sup> percentile of the Horizontal Navigation System Error (HNSE) over a day, at the monitored sites when applying EGNOS messages. The HNSE is measured only when there is a valid NPA navigation solution.*

Following table shows the monthly average of EGNOS NPA Accuracy values in meters according to the previous definition per operational GEO satellite.

Accuracy [m] (95%) Both GEOs	PRN 120	PRN 124
MLG	10.90	10.97
SDC	6.38	6.41
PDM	4.81	4.71
LSB	8.58	8.55
TRD	2.26	2.23
CRK	1.48	1.44
ZUR	1.37	1.38
BRN	1.36	1.36
TLS	3.22	3.15
TRO	2.71	2.79
LAP	2.86	2.91
SWA	1.42	1.42
ROM	2.41	2.50
ALB	1.47	1.49
GLG	1.71	1.79
KIR	2.81	2.86
GVL	1.83	1.96
WRS	1.79	1.87
CTN	5.81	5.59
MAD	13.69	13.80
TOR	4.07	3.89

Table 4 – Average of EGNOS NPA Accuracy on PRN 120 and 124 at reference stations.

### 3.2 EGNOS Approach with Vertical guidance (APV-I)

#### 3.2.1 EGNOS APV-I Availability

*EGNOS APV-I Availability is defined here as the percentage of epochs in a month in which the Protection Level are below Alert Limits for this APV-I service (HPL<40m and VPL<50m) over the total period.*

The following picture presents the EGNOS APV-I Availability over the current month using GEO-combined maps for PRN120 and PRN124.

For further information on the service area degradation, please refer to latest EGNOS Service Notice #2 [RD 4] available on ESSP website.

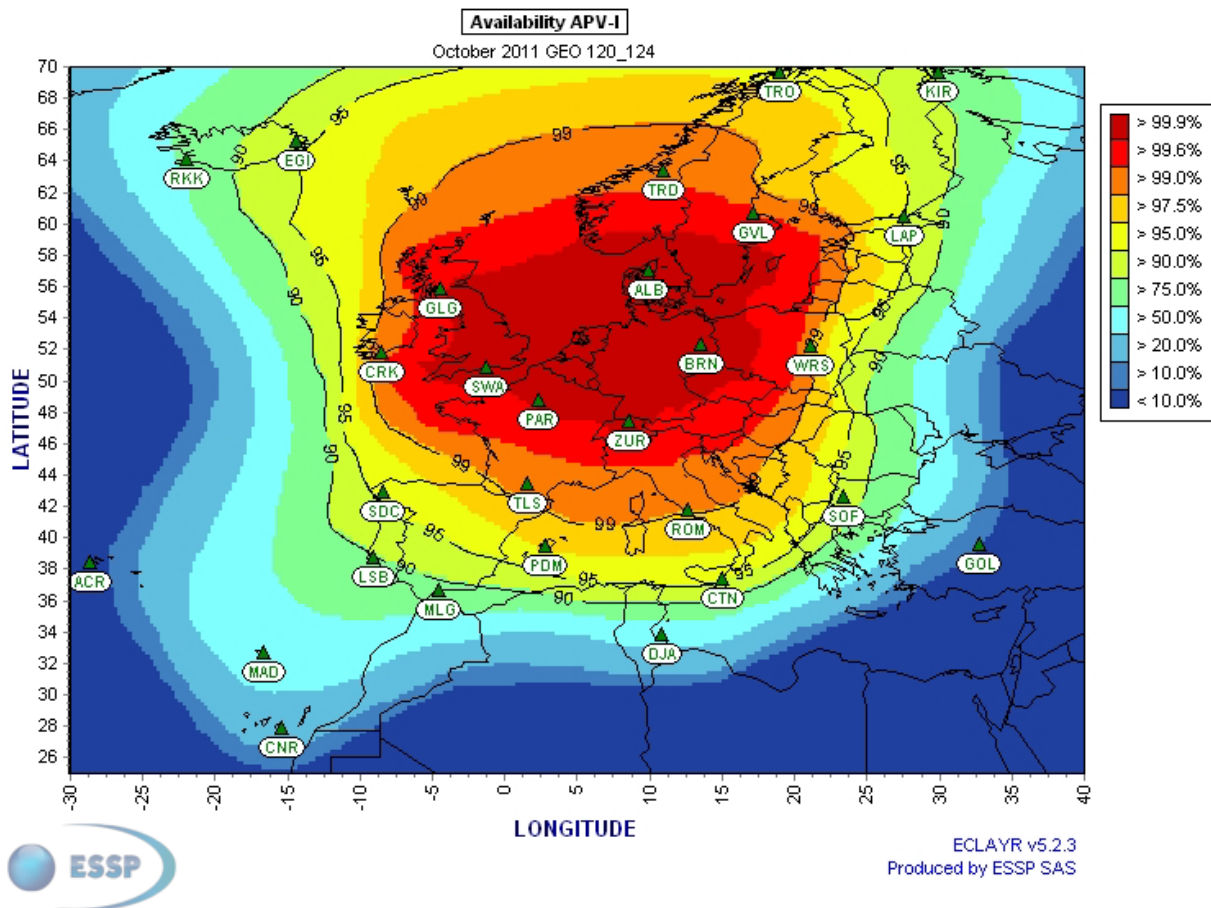


Figure 11 – EGNOS APV-I Availability.

### 3.2.2 EGNOS APV-I Continuity Risk

*EGNOS APV-I Continuity is defined here as the result of dividing the total number of single continuity breaks using a time-sliding window of 15 seconds by the number samples with valid and available PA navigation solution. A single continuity break occurs if the system is available and, at least one second of inside the following time-sliding window of 15 seconds becomes not available.*

The following picture presents the EGNOS APV-I Continuity over the current month using GEO-combined maps for PRN120 and PRN124.

For further information on the service area degradation, please refer to latest EGNOS Service Notice #2 [RD 4] available on ESSP website.

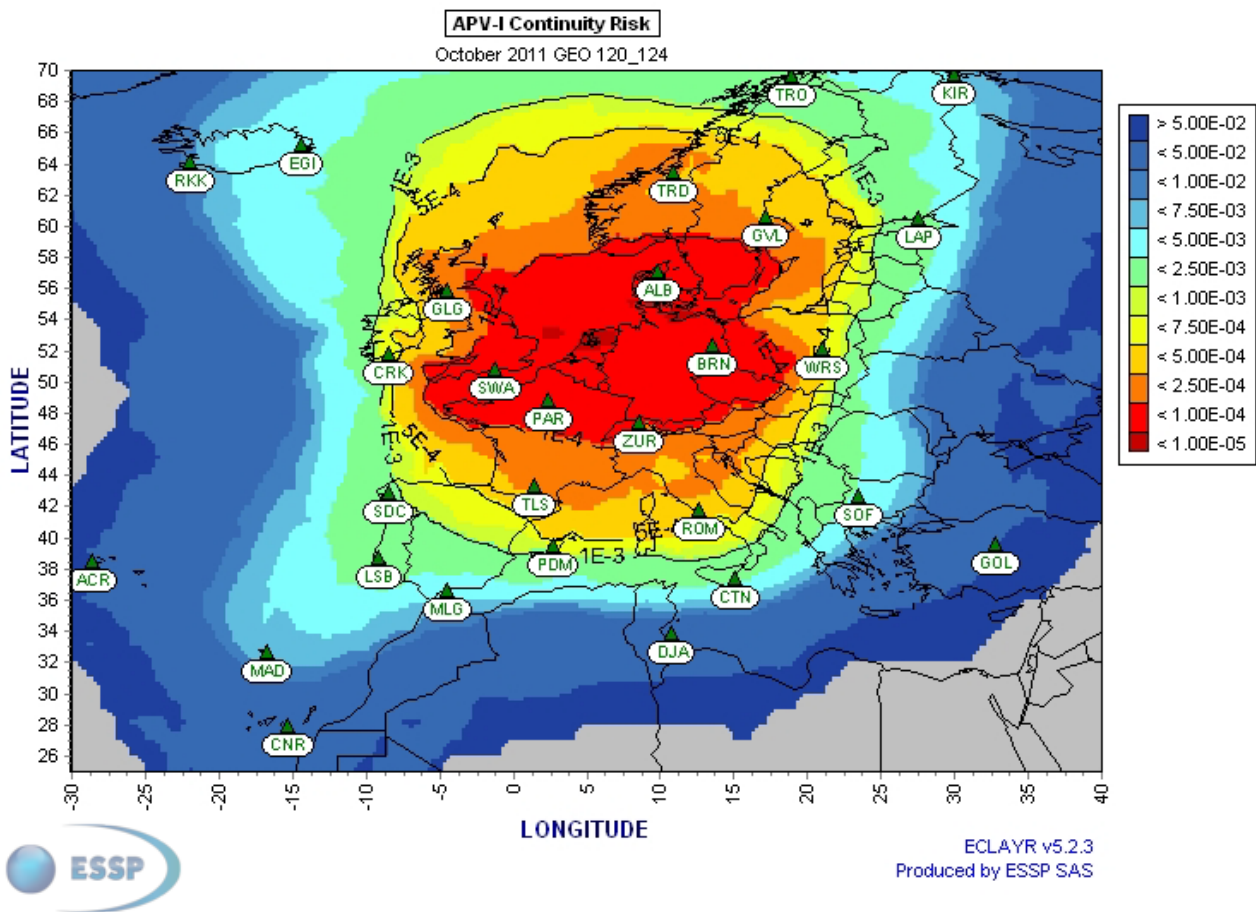


Figure 12 – EGNOS APV-I Continuity.

### 3.2.3 EGNOS APV-I Integrity

*EGNOS APV-I Integrity Event is identified in the present report when the Navigation System Error is greater or equal to the corresponding Protection Level for APV-I.*

No integrity event was detected.

*Safety Index is defined as the relation between Navigation System Error versus Protection Level (assuming PA algorithms to compute  $xNSE$  and  $xPL$ ) for each second. In case of ratio  $xPE/xPL$  is over 1; it indicates that a Misleading Information situation has occurred.*

Next figures provide the histogram for HSI (Horizontal Safety Index) and VSI (Vertical Safety Index) for each second when accumulating measurements from RIMS A sites over the current month. These histograms have considered that Protection Level is below APV-I Alarm Limit.

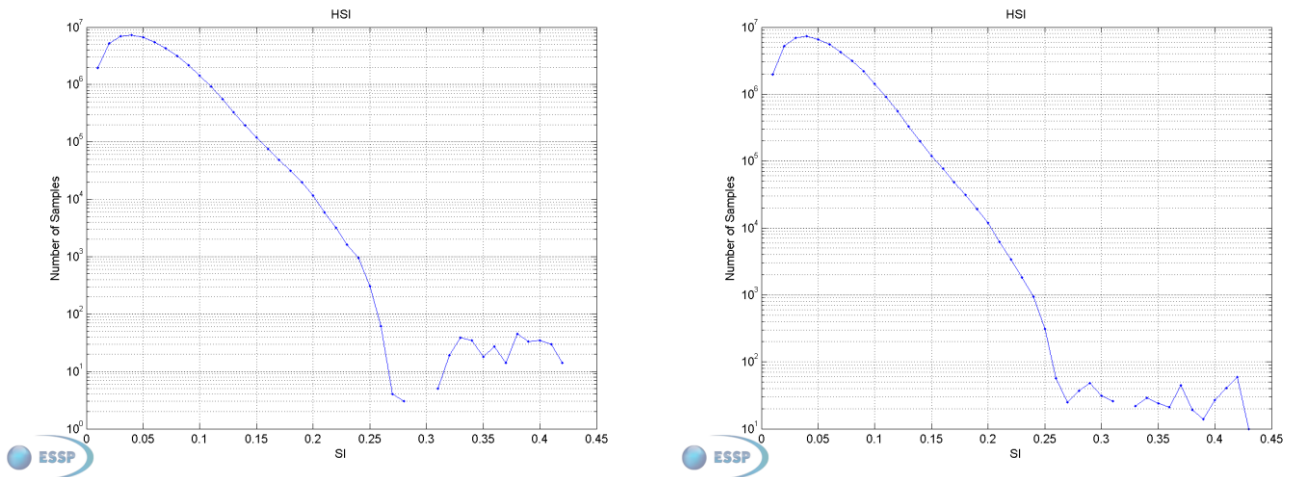


Figure 13 – EGNOS APV-I Horizontal Safety Index of the month: PRN 120 (left) and PRN124 (right).

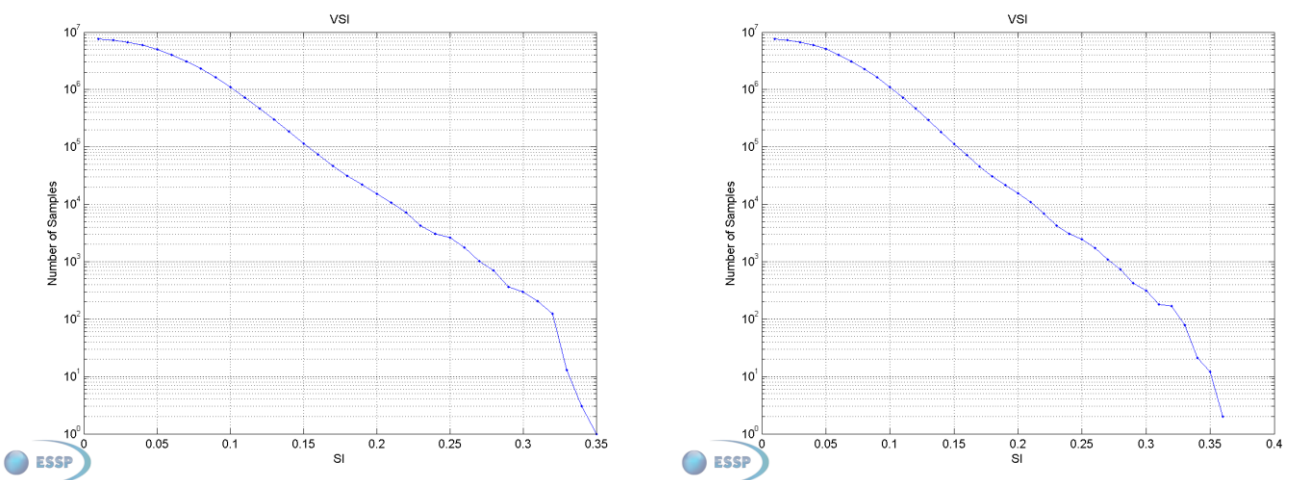


Figure 14 – EGNOS APV-I Vertical Safety Index of the month: PRN 120 (left) and PRN124 (right).



### 3.2.4 EGNOS APV-I Accuracy

*In this report, EGNOS APV-I Accuracy is defined as the monthly average value of 95<sup>th</sup> percentile of the Horizontal and Vertical Navigation System Error (HNSE and VNSE respectively) over a day, at the monitored sites when applying EGNOS messages. The HNSE and VNSE are measured only when there is a valid APV-I navigation solution.*

Following table shows the monthly average of EGNOS APV-I Accuracy values in meters according to the previous definition per operational GEO satellite.

Accuracy [m] (95%)		PRN 120	PRN 124
Both GEOs			
MLG	HPE	1.63	1.64
	VPE	1.95	1.97
SDC	HPE	1.38	1.38
	VPE	1.86	1.85
PDM	HPE	1.26	1.27
	VPE	1.77	1.77
LSB	HPE	1.62	1.63
	VPE	2.77	2.80
TRD	HPE	1.60	1.64
	VPE	2.85	2.82
CRK	HPE	1.39	1.35
	VPE	1.98	1.98
ZUR	HPE	1.28	1.30
	VPE	1.44	1.45
BRN	HPE	1.33	1.35
	VPE	1.68	1.69
TLS	HPE	1.05	1.06
	VPE	1.49	1.50
TRO	HPE	2.70	2.60
	VPE	4.40	4.47
LAP	HPE	1.85	1.81
	VPE	2.95	2.83
SWA	HPE	1.42	1.42
	VPE	1.82	1.83
ROM	HPE	1.08	1.06
	VPE	1.68	1.68
ALB	HPE	1.40	1.40
	VPE	2.43	2.54
GLG	HPE	1.22	1.24
	VPE	2.12	2.26
KIR	HPE	2.55	2.57
	VPE	4.58	4.67
GVL	HPE	1.42	1.41
	VPE	2.64	2.71
WRS	HPE	1.45	1.47
	VPE	1.90	1.91
CTN	HPE	1.35	1.35
	VPE	2.49	2.49
MAD	HPE	2.46	2.49
	VPE	3.11	3.21
TOR	HPE	1.35	1.34
	VPE	1.62	1.65

Table 5 – Average of EGNOS APV-I Accuracy on PRN 120 and 124 at reference stations.



## 4 EGNOS DATA ACCESS SERVICE (EDAS)

EDAS (EGNOS Data Access Service) offers ground-based access to EGNOS data. It is the single point of access for the data collected and generated by the EGNOS infrastructure composed of ground stations distributed over Europe and North Africa.

The main data provided by EDAS are:

- Raw GPS and EGNOS GEO observations and navigation data collected by the entire network of Ranging and Integrity Monitoring Stations (RIMS) and Navigation Land Earth Stations (NLES).
- EGNOS augmentation messages, as normally received by users via the EGNOS Geostationary satellites.

In addition, EDAS provides the Antenna Phase Centre Coordinates , which is a list of the geographical coordinates of all RIMS stations.

Data are available through two different formats, depending on the type of service selected:

- in Abstract Syntax Notation One (ASN.1), for Service Level 0;
- in RTCM 3.0 ([www.rtcn.org](http://www.rtcn.org)), for the Service Level 1.

For further details on the EDAS service, please visit the EDAS website (<http://www.gsa.europa.eu/go/egnos/edas>).

Below, the EDAS availability figure and downtime duration during October 2011, for both service levels (SL0 and SL1) are provided<sup>1</sup>.

	SL0	SL1	Global
EDAS Service Operational Availability	>99.97%	>99.97%	>99.97%
EDAS Service Operational Downtime	861 seconds	888 seconds	894 seconds

Table 6 – EDAS Availability.

<sup>1</sup> EDAS performances have been monitored during 99.99% of the reported period.



### **FOR MORE INFORMATION**

To get more information about EGNOS performances, please visit the EGNOS user Support web site at

<http://egnos-user-support.essp-sas.eu/>

or

contact the EGNOS helpdesk at

[egnos-helpdesk@essp-sas.eu](mailto:egnos-helpdesk@essp-sas.eu)

### **TO PROVIDE YOUR FEEDBACK**

You can provide us with your feedback on the EGNOS SoL use and service provision by filling the following [questionnaire](#).

A button inside allows returning the questionnaire automatically to ESSP.

### **DISCLAIMER**

All data and information (hereinafter the "Data") provided within this document are for informational purposes only. This document does not provide the ESSP interpretation of the Data.

The European Union, as owner of EGNOS, and ESSP SAS, as EGNOS services provider, disclaim all warranties of any kind (whether express or implied) to any party and/or for any use of the Data including, but not limited to, their accuracy, integrity, reliability and fitness for a particular purpose or user requirements.

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Text and pictures that are part of the Data may be protected by property rights. Any use shall require the prior written agreement of ESSP SAS.

## APPENDIX A      REFERENCE DOCUMENTS

[RD 1]	Open Service Definition Document, EGN-SDD-OS; v.01-01 (available in <a href="http://www.essp-sas.eu/service_definition_documents">http://www.essp-sas.eu/service_definition_documents</a> )
[RD 2]	Safety Of Life Definition Document , EGN-SDD SoL, v.01-00 (available in <a href="http://www.essp-sas.eu/service_definition_documents">http://www.essp-sas.eu/service_definition_documents</a> )
[RD 3]	Service Notice #1 MT9-MT17 status (available in <a href="http://www.essp-sas.eu/service_notices">http://www.essp-sas.eu/service_notices</a> )
[RD 4]	Service Notice #2 EGNOS status in October (available in <a href="http://www.essp-sas.eu/service_notices">http://www.essp-sas.eu/service_notices</a> )



## APPENDIX B LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
ALB	Alborg
APV	Approach with Vertical Guidance
ASN	Abstract Syntax Notation
BRN	Berlin
CRK	Cork
CTN	Catania
ECAC	European Civil Aviation Conference
EDAS	EGNOS Data Access Service
EGNOS	European Geostationary Navigation Overlay Service
ESSP	European Satellite Services Provider
GEO	Geostationary Satellite
GLG	Glasgow
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GVL	Gävle
HNSE	Horizontal Navigation System Error
HPE	Horizontal Position Error
HPL	Horizontal Protection Level
LAN	Langen
LSB	Lisbon
MAD	Madeira
MI	Misleading Information
MLG	Málaga
NA	Not Applicable/ Not Available
NLES	Navigation Land Earth Station
NPA	Non-Precision Approaches
OP	Operation
OPS	Operations
OS	Open Service
PA	Precision Approach
PDM	Palma De Mallorca
PL	Protection Level
PRN	Pseudo-Random Number



RAIM	Receiver Autonomous Integrity Monitoring
RD	Reference Document
RIMS	Ranging and Integrity Monitoring Station
ROM	Roma
RTCM	Radio Technical Commission for Maritime Services
SBAS	Satellite-Based Augmentation System
SCZ	Scanzano
SDC	Santiago De Compostela
SDD	Service Definition Document
SIS	Signal-In-Space
SLO	Service Level 0
SL1	Service Level 1
SWA	Swanwick
TERESA	TEsting Receiver for EGNOS using Software Algorithms
TLS	Toulouse
TOR	Torrejón
TRD	Trondheim
TRO	Tromsø
TWAN	Transport Wide Area Network
UK	United Kingdom
VNSE	Vertical Navigation System Error
VPE	Vertical Position Error
VPL	Vertical Protection Level
WRS	Warsaw
ZUR	Zurich



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